10-7 What are volts, amps, and ohms?

Objective ▸ Use the correct units to measure voltage, current, and resistance.

TechTerms

- **ampere:** unit used to measure electric current
- **electromotive force:** force that makes electrons move
- **ohm:** unit used to measure resistance
- **resistance:** opposition to the flow of electric current
- **volt:** unit used to measure electromotive force

Electromotive Force Electric current is made of moving electrons. The force that makes the electrons move is the **electromotive force.** Electromotive force is abbreviated **EMF.** Electromotive force is measured in units called **volts.** Voltage is measured with an instrument called a voltmeter.

Define: What is EMF?

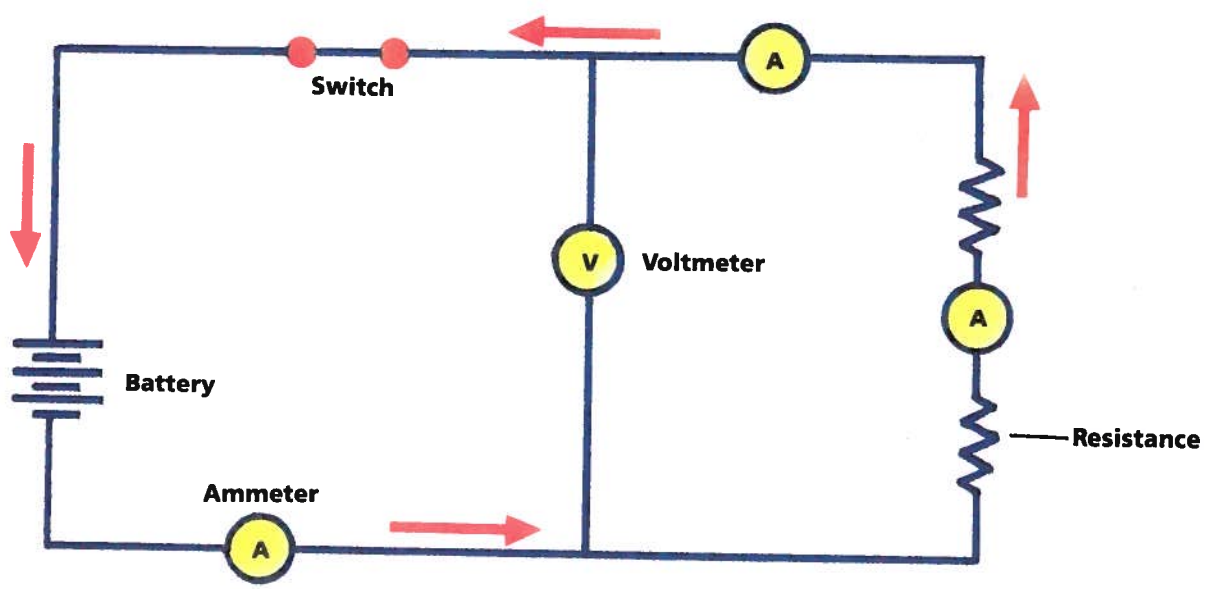
Current The amount of electric current depends on the number of electrons flowing through a wire. The unit for measuring electric current is the **ampere,** or amp. The ampere is a measure of the number of electrons flowing in a circuit in a given amount of time. One ampere is the amount of current passing a point each second. Current is measured with a device called an ammeter.

Identify: What does an ampere measure?

Resistance When electric current flows through a wire, the electrons are slowed down a bit by the wire. The electric current meets a certain **resistance** from the wire. Resistance opposes the flow of electrons in a circuit. Resistance is similar to friction. The unit for measuring resistance is the **ohm.** Four things affect the resistance of a wire.

- **Length** The longer a wire is, the more resistance it has.
- **Width** The thinner a wire is, the more resistance it has.
- **Material** Wires made of poor conductors have more resistance than wires made of good conductors.
- **Temperature** As a wire gets hotter, its resistance increases.

Name: In what units is resistance measured?



LESSON SUMMARY

- Electromotive force is the force that moves electrons in a circuit.
- The amount of electric current depends on the number of electrons flowing in a circuit.
- As current flows through a wire, it meets resistance from the wire.
- Resistance of a wire depends on length, thickness, material, and temperature.

CHECK *Write true if the statement is true. If the statement is false, change the underlined term to make the statement true.*

1. A thick wire will have less resistance than a thin wire.
2. Current is measured in volts.
3. A cool wire will have more resistance than a hot wire.
4. The force that makes electrons move is called electromotive force.
5. The resistance in a wire helps the flow of electric current.
6. A long wire has less resistance than a short wire.
7. The unit for voltage is the volt.

APPLY *Complete the following.*

8. **Hypothesize:** Which has more resistance, a conductor or an insulator? Why?

InfoSearch

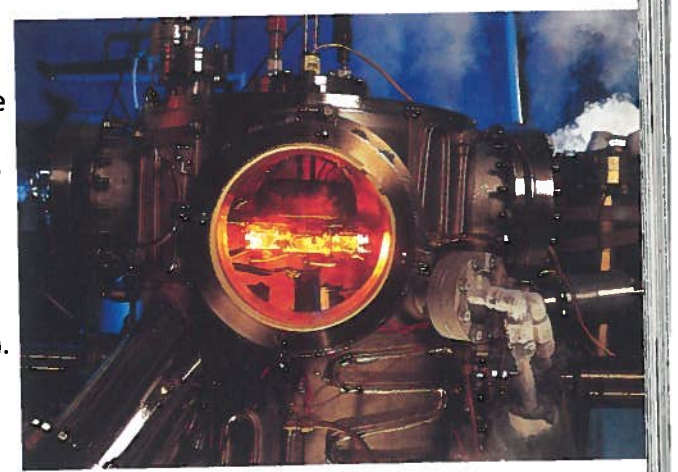
Read the passage. Ask two questions about the topic that you cannot answer from the information in the passage.

Volts, Amps, Ohms Many units of measurement in science are taken from the names of famous scientists. Volts are named after Alessandro Volta. Volta was an Italian professor of physics. Amperes are named in honor of Andre Marie Ampere. He was a French physicist and mathematician. Ohms are named for Georg Ohm, a German physicist.

SEARCH: Use library references to find answers to your questions.

TECHNOLOGY AND SOCIETY

SUPERCONDUCTORS



Electric current needs a conductor in which to flow. Usually, this is a metal wire. If the wire is cooled, its resistance decreases. As the wire gets colder and colder, the resistance keeps decreasing. The lower the resistance, the more current can flow. At absolute zero, −273°C, a wire will have zero resistance. A conductor with near-zero resistance is known as a superconductor.

Scientists want to develop materials that become superconductors at room temperature (22°C). These materials are called high-temperature superconductors (HTS). Researchers have not yet discovered any room-temperature HTS materials. They have found some HTS materials that work at temperatures as high as −103°C.

Researchers are developing thin films of HTS to coat other materials. They are testing these HTS materials in very sensitive magnetic detectors used for medical diagnoses. They are also testing HTS materials for carrying microwave signals used for mobile telephones. Much research still needs to be done before superconductors become part of our daily lives.